DSS-13 Remote Operations

Learning to Safely and Efficiently Operate DSS-13 From a Remote Workstation

Introduction

- If scheduled, DSS-13 may be operated from a remote workstation regardless of station manning
- Schedule time will be allocated to trained, station approved, operators only
- This package contains access, operation, and safety training material for remote operators
- We have made positive progress to allow remote operation. Don’t be the one to prove it’s a bad idea

Agenda

- EAC processes and GUIs
- Safety
- Access Procedures
- Receiver Configuration
- Antenna Startup
- Operation
- Shutdown
- Operator Interface Details
- Script Operation
- In Case of Trouble

Overview

- Safe, reliable operation depends on operators understanding each piece of the puzzle and how they interact
- Scripts affect safety
- GUIs affect ops
- Safety affects access
- Etc

Vocabulary

- 890-131. DSN inter-processor protocol standard used by DSN equipment
- APC. Antenna Pointing Controller
- Assign. DSN equipment with an 890-131 interface requires assignment blocks to begin communications with the EAC. Sends an address table and the assignment blocks
- EAC. Equipment Activity Controller. The station controller
- E-Stop. Emergency Stop. Hardwired system to shutdown the antenna. Independent of APC control

Vocabulary 2

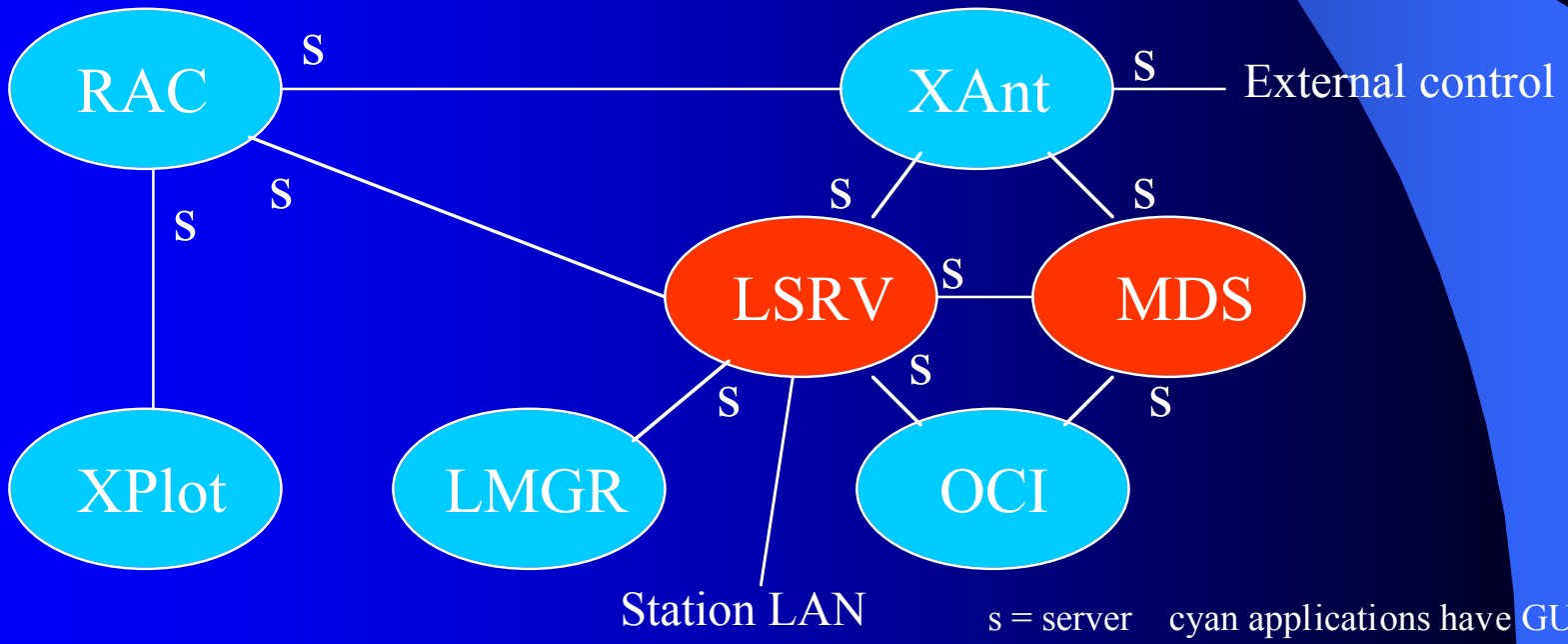
- LMGR. Link Manager. Controls and monitors assignments and data flow to 890-131 devices
- LSRV. Link Server. Server for Link Manager client. Provides 890-131 interface
- MDS. Monitor Data Server. Client of LSRV and server for XAnt. Stores monitor data for XAnt
- OCI. Operator Command Input. Allows input of commands not implemented in XAnt
- RAC. Radio Astronomy Controller. Controls switches, receivers, and the radiometer
- Script. Text file containing a sequence of commands for execution by XAnt

Vocabulary 3

- Stow. Command to send the antenna to a predetermined position (135 deg Az, 89.9 deg El) and insert the stow pin
- Un-assign. Send a block to 890-131 equipment to stop link communications
- XAnt. Antenna control GUI
- XPlot. Strip Chart graphical display of system temperature and receiver calibration results

Applications and GUIs

- Murphy will interfere less if you understand the system
- Applications connect as client-servers



User Responsible for Safety

- Top priority is personnel safety
  - Read and understand safety documents and operating procedures identified at the end of this presentation
  - Telephone before move when station manned
  - Arrange for audio page when station unmanned
  - Visually verify no one on or around structure
  - Visually check ellipsoid area
  - Do not operate without operational video system
  - Don’t flirt with hardware limits, high winds, or a balky control system. This could lead to a special trip to the station in the middle of the night
  - Never operate unless scheduled or approved for ad hoc access by station personnel

User Responsible for Safety 2

- Hardware protection second priority
  - Usually, protecting hardware protects people, but sacrifice hardware if necessary
  - Visually check pad and track for obstructions
  - Visually check ellipsoid for obstructions
  - Make conservative choices. Choose an alternate source rather than going within a few deg. of a software limit
  - Stow the antenna rather than operate in high winds or with a balky control system
  - Check system at least every twenty minutes if leaving console

Hardware Safety Devices

- Seismic sensor
  - E-Stops antenna. Cannot be reset remotely
- Limit switches
  - Stop antenna after software limits exceeded
- Bumper E-Stop switches
- E-Stop buttons and key switch
- Video surveillance
  - Three pan, tilt, and zoom cameras. Two antenna views and pedestal room
- Weather station
  - Provides wind speed to RAC->EAC->APC

Software Safety Processes

- APC stows antenna based on wind speed
- APC provides software position, rate, and acceleration limits
- EAC E-Stops antenna if APC runaway suspected
- EAC stows antenna if XAnt disconnected too long

Access Procedure

- You can interfere with others. Please restrict your access to times authorized
- Obtain access schedule through the DSN seven day schedule
- Ad hoc access may be granted by station personnel
- Once your scheduled time has arrived, you may connect LMGR to LSRV, start MDS and the rest of the EAC applications, but don't start the antenna without following the safety procedures described in the *Remote Operator Instructions for DSS-13*

Receiver Configuration

- Most receiver configurations can be controlled through the RAC, but some must be set up by station personnel
- See the *DSS-13 User's Guide* for available commands
- You may ask station personnel to set up your configuration before going home
- Test remote set up before scheduling an activity requiring it

Antenna Startup

- Follow the safety procedures in the *Remote Operator Instructions for DSS-13*
  - Telephone clearance to rotate antenna
  - Safety page
  - Wind speed check
  - Visual checks
- Select source
- Start and watch events from APC

Operation

- Pay attention to what is going on
  - Are you on the correct wrap?
  - Did the antenna drive in the direction indicated on XAnt?
  - Are the system responses normal?
- Take action if the system is not ok
  - E-Stop immediately if the wrap indication is wrong. Then verify your observation. ***Do Not Move*** the antenna if the wrap indicator is wrong. Catastrophic damage can occur
  - Stow the antenna while you can if you repeatedly lose control or X Windows response times are slowing significantly

Shutdown

- Always leave the antenna in a safe condition
  - Stowed with the E-Stop set
  - Running for an immediate hand-over
- A green “Stowed” indicator on XAnt indicates a completed stow operation
  - Antenna at stow position
  - Electronics shut down
  - Stow pin inserted

Shutdown 2

- Once the antenna is stowed, activate the E-Stop
- Once the antenna is stowed and the E-Stop is set, you may kill the EAC applications
  - XAnt, XPlot, OCI, MDS, and LMGR
- Do not kill LSRV without specific reason

Operator Interfaces

- The LMGR GUI provides the following
  - Link assignment/un-assignment
  - LSRV disconnect/reconnect
  - RAC disconnect/reconnect
  - System temperature readout
  - Weather readout
  - System temperature and weather watchdogs
  - LSRV kill (not routinely used)

Operator Interfaces 2

- The XAnt GUI provides the following
  - Pulldown menus
    - File: Predict file maintenance and source selection
    - Configure: Receiver selection, pointing corrections, temperature logs, and RAC connection
    - Command: Offset management, “On-Point” limit, Scan mode, Subreflector control, and RAC command
    - View: Sidereal time
  - A toolbar for offsets, scans, antenna start/stop, and E-Stop

Operator Interfaces 3

- A graphical display of antenna position, limits, cable wrap, source trajectory, and source position
- A rule based indicator of antenna state
- Antenna rates
- Antenna position
- Source name
- Primary frequency

Operator Interfaces 4

- Pointing correction status
- DOY and UTC
- A graphical display of beam and position offsets
- “On-Point” error limits and pointing status
- Noise temperature/source temperature
- Weather data including wind speed

Operator Interfaces 5

- The XPlot GUI provides the following
  - Selection of gain/linearity or temperature plot
  - Power log control
  - Channel selection (1 of 4) displaying received frequency and polarization tags
  - Temperature scale selection (1-50,000K)
  - Temperature scale calibration and bias input
  - Received power level
  - Time span selection (1 min to 50 min)

Operator Interfaces 6

- The OCI GUI provides the following
  - Link selection buttons
  - A command entry line
  - Scrollable command history

Script Operation

- Control scripts can be run, but there is no management tool, yet
  - The user must edit to control where restarts occur
  - There is no pre-pass validity or syntax checking
  - Use a standard text editor to change commands
- Acceptable commands are listed in the *DSS-13 User's Guide*

In Case of Trouble

- TBD

Summary

- DSS-13 can be configured and operated by qualified experimenters with or without station personnel on site. Note that some configurations must be established by station personnel
- Station personnel are available to run passes for experimenters who do not desire real-time interaction with the system
  - Station personnel can run sequences or scripts provided by experimenters, and can generate scripts for experimenters as desired

Summary

- We have the capability and privilege to operate DSS-13 from remote workstations. Please be responsible and careful. Protect that privilege

Where to Get More Information

- *Safety Procedure for 34-m Antenna, Venus Station (DSS 13)*, DSN document 440-5C-3SI-110C, June 22, 1994
- *Remote Operator Instructions for DSS-13*
- *DSS-13 User's Guide*
- *Software Operator's Manual, Antenna Pointing Control Software,* DSN SOM-DOA-5556-OP-B.2